

**IN THE CLAIMS:**

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~striketrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please CANCEL claims 2, 3, 6, 8, 11, 13, 16, 23, 34 and 35 without prejudice or disclaimer, and AMEND claims 1, 4, 7, 12, 14, 15, 19, 20, 24 and 28 in accordance with the following:

1. (currently amended) A magnetron, comprising:
  - a ring-shaped anode forming a plurality of resonance circuits;
  - a cathode disposed at an axial center of the anode to emit thermions, separated from the anode by a predetermined space;
  - a ring-shaped permanent magnet provided above the anode;
  - an upper pole piece having a magnetic flux dispersing structure to carry magnetic flux generated by the permanent magnet to an upper portion of the predetermined space,
    - wherein the upper pole piece comprises:
      - a ring-shaped magnetic flux receiving portion disposed between the permanent magnet and the anode to receive magnetic flux generated by the permanent magnet;
      - a slanted portion downwardly slantingly extended from an inner edge of the ring-shaped magnetic flux receiving portion to an upper portion of the predetermined space to carry received magnetic flux to the upper portion of the predetermined space; and
      - a magnetic flux dispersing portion upwardly slantingly extended from an inner edge of the slanted portion to disperse the carried magnetic flux;
  - a lower pole piece carrying the magnetic flux to a lower portion of the predetermined space; and
  - at least one yoke magnetically connecting the permanent magnet with the lower pole piece.
2. (cancelled)
3. (cancelled)

4. (currently amended) A magnetron, comprising:  
a ring-shaped anode forming a plurality of resonance circuits;  
a cathode disposed at an axial center of the anode to emit thermions, separated from the anode by a predetermined space;  
a ring-shaped permanent magnet provided above the anode;  
an upper pole piece having a magnetic flux dispersing structure to carry magnetic flux generated by the permanent magnet to an upper portion of the predetermined space;  
a lower pole piece having a magnetic flux concentrating structure to carry the magnetic flux to a lower portion of the predetermined space,

wherein the lower pole piece comprises:

a ring-shaped magnetic flux receiving portion designed to receive magnetic flux carried through the at least one yoke from the permanent magnet; and  
a slanted portion upwardly slantingly extended from an inner edge of the ring-shaped magnetic flux receiving portion to the lower portion of the predetermined space to carry the received magnetic flux to the lower portion of the predetermined space; and  
at least one yoke magnetically connecting the permanent magnet with the lower pole piece.

5. (original) The magnetron as set forth in claim 4, wherein the upper pole piece comprises a ring-shaped magnetic flux receiving portion disposed between the permanent magnet and the anode to receive magnetic flux generated by the permanent magnet, a slanted portion downwardly slantingly extended from an inner edge of the ring-shaped magnetic flux receiving portion to an upper portion of the predetermined space to carry received magnetic flux to the upper portion of the predetermined space, and a magnetic flux dispersing portion upwardly slantingly extended from an inner edge of the slanted portion to disperse the carried magnetic flux.

6. (cancelled)

7. (currently amended) The magnetron as set forth in claim 6~~5~~, wherein an angle formed between the magnetic flux receiving portion and slanted portion of the lower pole piece is greater than an angle formed between the magnetic flux receiving portion and slanted portion of the upper pole piece.

8. (cancelled)

9. (withdrawn) A magnetron, comprising:  
a ring-shaped anode forming a plurality of resonance circuits;  
a cathode disposed at an axial center of the anode to emit thermions, separated from the anode by a predetermined space;  
a ring-shaped permanent magnet provided below the anode;  
an upper pole piece having a magnetic flux dispersing structure to carry magnetic flux generated by the permanent magnet to an upper portion of the predetermined space;  
a lower pole piece carrying the magnetic flux to a lower portion of the predetermined space; and  
at least one yoke magnetically connecting the permanent magnet with the lower pole piece.

10. (withdrawn) The magnetron as set forth in claim 9, wherein the lower pole piece comprises a ring-shaped magnetic flux receiving portion disposed between the permanent magnet and the anode to receive magnetic flux generated by the permanent magnet, a slanted portion downwardly slantingly extended from an inner edge of the ring-shaped magnetic flux receiving portion to an upper portion of the predetermined space to carry received magnetic flux to the upper portion of the predetermined space, and a magnetic flux dispersing portion upwardly slantingly extended from an inner edge of the slanted portion to disperse the carried magnetic flux.

11. (cancelled)

12. (currently amended) A magnetron, comprising:  
a ring-shaped anode forming a plurality of resonance circuits;  
a cathode disposed at an axial center of the anode to emit thermions, separated from the anode by a predetermined space;  
a ring-shaped permanent magnet provided above the anode;  
~~a lower pole piece~~ an upper pole piece having a magnetic flux dispersing structure to carry magnetic flux generated by the permanent magnet to an upper portion of the predetermined space;  
~~an upper pole piece~~ a lower pole piece having a magnetic flux concentrating structure to carry the magnetic flux to a lower portion of the predetermined space;  
wherein the upper pole piece comprises:  
a ring-shaped magnetic flux receiving portion disposed between the permanent magnet and the anode to receive magnetic flux generated by the permanent magnet;

a slanted portion downwardly slantingly extended from an inner edge of the ring-shaped magnetic flux receiving portion to an upper portion of the predetermined space to carry received magnetic flux to the upper portion of the predetermined space; and

a magnetic flux dispersing portion upwardly slantingly extended from an inner edge of the slanted portion portion to disperse the carried magnetic flux; and

at least one yoke magnetically connecting the permanent magnet with the lower pole piece.

13. (cancelled)

14. (currently amended) The magnetron as set forth in claim ~~13~~<sup>12</sup>, wherein the ~~upper-lower~~ pole piece comprises a ring-shaped magnetic flux receiving portion designed to receive magnetic flux carried through the at least one yoke from the permanent magnet, and a slanted portion upwardly slantingly extended from an inner edge of the ring-shaped magnetic flux receiving portion to the lower portion of the predetermined space to carry the received magnetic flux to the lower portion of the predetermined space.

15. (currently amended) The magnetron as set forth in claim 14, wherein an angle formed between the magnetic flux receiving portion and slanted portion of the ~~upper-lower~~ pole piece is greater than an angle formed between the magnetic flux receiving portion and slanted portion of the ~~lower-upper~~ pole piece.

16. (cancelled)

17. (original) A microwave oven, comprising:  
a magnetron as set forth in claim 1.

18. (original) A high frequency heating apparatus, comprising:  
a magnetron as set forth in claim 1.

19. (currently amended) A microwave oven, comprising:  
a cooking cavity in which food is placed to be cooked;  
a heating unit to heat the food, the heating unit comprising:  
a magnetron, comprising:

a ring-shaped anode forming a plurality of resonance circuits;

a cathode disposed at an axial center of the anode to emit thermions, separated

from the anode by a predetermined space;

a ring-shaped permanent magnet provided above the anode;

an upper pole piece having a magnetic flux dispersing structure to carry magnetic flux generated by the permanent magnet to an upper portion of the predetermined space;

a lower pole piece having a magnetic flux concentrating structure to carry the magnetic flux to a lower portion of the predetermined space,

wherein the lower pole piece comprises:

a ring-shaped magnetic flux receiving portion designed to receive magnetic flux carried through the at least one yoke from the permanent magnet; and

a slanted portion upwardly slantingly extended from an inner edge of the ring-shaped magnetic flux receiving portion to the lower portion of the predetermined space to carry the received magnetic flux to the lower portion of the predetermined space; and

at least one yoke magnetically connecting the permanent magnet with the lower pole piece.

~~a ring-shaped anode forming a plurality of resonance circuits;~~

~~a cathode disposed at an axial center of the anode to emit thermions, separated from the anode by a predetermined space;~~

~~a ring-shaped permanent magnet provided above the anode;~~

~~an upper pole piece carrying magnetic flux generated by the permanent magnet to an upper portion of the predetermined space;~~

~~at least one yoke; and~~

~~a lower pole piece comprising a ring-shaped magnetic flux receiving portion designed to receive magnetic flux carried through the at least one yoke from the permanent magnet, and a slanted portion upwardly slantingly extended from an inner edge of the ring-shaped magnetic flux receiving portion to a lower portion of the predetermined space to carry received magnetic flux to the lower portion of the predetermined space, wherein the at least one yoke magnetically connects the permanent magnet to the lower pole piece; and~~

~~a control unit to control an amount of heat produced by the heating unit.~~

20. (currently amended) A microwave oven, comprising:

a cooking cavity in which food is placed to be cooked;

a heating unit to heat the food, the heating unit comprising:

a magnetron, comprising:

a ring-shaped anode forming a plurality of resonance circuits;

a cathode disposed at an axial center of the anode to emit thermions, separated from the anode by a predetermined space;

a ring-shaped permanent magnet provided above the anode;  
an upper pole piece having a magnetic flux dispersing structure to carry  
magnetic flux generated by the permanent magnet to an upper portion of the predetermined  
space;  
a lower pole piece having a magnetic flux concentrating structure to carry  
the magnetic flux to a lower portion of the predetermined space,  
wherein the upper pole piece comprises:  
a ring-shaped magnetic flux receiving portion disposed  
between the permanent magnet and the anode to receive magnetic flux generated by the  
permanent magnet;  
a slanted portion downwardly slantingly extended from an  
inner edge of the ring-shaped magnetic flux receiving portion to an upper portion of the  
predetermined space to carry received magnetic flux to the upper portion of the predetermined  
space; and  
a magnetic flux dispersing portion upwardly slantingly  
extended from an inner edge of the slanted portion to disperse the carried magnetic flux; and  
at least one yoke magnetically connecting the permanent magnet with the  
lower pole piece.  
~~a ring-shaped anode forming a plurality of resonance circuits;~~  
~~a cathode disposed at an axial center of the anode to emit thermions;~~  
~~separated from the anode by a predetermined space;~~  
~~a ring-shaped permanent magnet provided above the anode;~~  
~~an upper pole piece having a magnetic flux dispersing structure to carry~~  
~~magnetic flux generated by the permanent magnet to an upper portion of the predetermined~~  
~~space;~~  
~~a lower pole piece having a magnetic flux concentrating structure to carry~~  
~~the magnetic flux to a lower portion of the predetermined space; and~~  
~~at least one yoke magnetically connecting the permanent magnet with the~~  
~~lower pole piece; and~~  
~~a control unit to control an amount of heat produced by the heating unit.~~

21. (withdrawn) A microwave oven, comprising:  
a cooking cavity in which food is placed to be cooked;  
a heating unit to heat the food, the heating unit comprising:  
a magnetron, comprising:  
a ring-shaped anode forming a plurality of resonance circuits;

a cathode disposed at an axial center of the anode to emit thermions,  
separated from the anode by a predetermined space;  
a ring-shaped permanent magnet provided below the anode;  
an upper pole piece having a magnetic flux dispersing structure to carry  
magnetic flux generated by the permanent magnet to an upper portion of the predetermined  
space;  
a lower pole piece carrying the magnetic flux to a lower portion of the  
predetermined space; and  
at least one yoke magnetically connecting the permanent magnet with the  
lower pole piece; and  
a control unit to control an amount of heat produced by the heating unit.

22. (original) A microwave oven, comprising:  
a cooking cavity in which food is placed to be cooked;  
a heating unit to heat the food, the heating unit comprising:  
a magnetron, comprising:  
a ring-shaped anode forming a plurality of resonance circuits;  
a cathode disposed at an axial center of the anode to emit thermions,  
separated from the anode by a predetermined space;  
a ring-shaped permanent magnet provided above the anode;  
at least one yoke;  
a lower pole piece carrying magnetic flux generated by the permanent  
magnet to an upper portion of the predetermined space;  
an upper pole piece comprising a ring-shaped magnetic flux receiving  
portion designed to receive magnetic flux carried through the at least one yoke from the  
permanent magnet, and a slanted portion upwardly slantingly extended from an inner edge of  
the ring-shaped magnetic flux receiving portion to a lower portion of the predetermined space to  
carry received magnetic flux to the lower portion of the predetermined space; and  
the at least one yoke magnetically connecting the permanent magnet with  
the lower pole piece; and  
a control unit to control an amount of heat produced by the heating unit.

23. (cancelled)

24. (currently amended) A magnetron, comprising:  
a concentric cathode-anode pair, the anode being a ring-shaped anode forming a

plurality of resonance circuits and the cathode separated from the anode by a space;

a ring-shaped permanent magnet provided above the anode;

an upper pole piece having a magnetic flux dispersing structure to carry magnetic flux generated by the permanent magnet to an upper portion of the predetermined space;

a lower pole piece having a magnetic flux concentrating structure to carry the magnetic flux to a lower portion of the predetermined space,

wherein the lower pole piece comprises:

a ring-shaped magnetic flux receiving portion designed to receive magnetic flux carried through the at least one yoke from the permanent magnet; and

a slanted portion upwardly slantingly extended from an inner edge of the ring-shaped magnetic flux receiving portion to the lower portion of the predetermined space to carry the received magnetic flux to the lower portion of the predetermined space; and

at least one yoke magnetically connecting the permanent magnet with the lower pole piece.

~~a ring-shaped permanent magnet provided above the anode;~~

~~an upper pole piece having a magnetic flux dispersing structure to carry magnetic flux generated by the permanent magnet to an upper portion of the space;~~

~~a lower pole piece carrying the magnetic flux to a lower portion of the space; and~~

~~at least one yoke magnetically connecting the permanent magnet with the lower pole piece.~~

25. (original) The magnetron as set forth in claim 24, wherein the upper pole piece comprises a ring-shaped magnetic flux receiving portion disposed between the permanent magnet and the anode to receive magnetic flux generated by the permanent magnet, a slanted portion downwardly slantingly extended from an inner edge of the ring-shaped magnetic flux receiving portion to an upper portion of the predetermined space to carry received magnetic flux to the upper portion of the predetermined space, and a magnetic flux dispersing portion upwardly slantingly extended from an inner edge of the slanted portion to disperse the carried magnetic flux.

26. (original) A high frequency apparatus, comprising:

a high frequency particle accelerating unit comprising:

a magnetron, comprising:

a ring-shaped anode forming a plurality of resonance circuits;

a cathode disposed at an axial center of the anode to emit thermions, separated from the anode by a predetermined space;



a ring-shaped permanent magnet provided above the anode;  
an upper pole piece carrying magnetic flux generated by the permanent magnet to an upper portion of the predetermined space;  
at least one yoke; and  
a lower pole piece comprising a ring-shaped magnetic flux receiving portion designed to receive magnetic flux carried through the at least one yoke from the permanent magnet, and a slanted portion upwardly slantingly extended from an inner edge of the ring-shaped magnetic flux receiving portion to a lower portion of the predetermined space to carry received magnetic flux to the lower portion of the predetermined space, wherein the at least one yoke magnetically connects the permanent magnet to the lower pole piece, the magnetron generating a high frequency particle beam; and  
a control unit to control an intensity of the high frequency particle beam.

27. (original) The high frequency apparatus of claim 26, wherein the apparatus is one of: a high frequency heating apparatus, a particle accelerator and a radar unit.

28. (currently amended) A high frequency apparatus, comprising:  
a high frequency particle accelerating unit comprising:  
a magnetron, comprising:  
a ring-shaped anode forming a plurality of resonance circuits;  
a cathode disposed at an axial center of the anode to emit thermions,  
separated from the anode by a predetermined space;  
a ring-shaped permanent magnet provided above the anode;  
an upper pole piece having a magnetic flux dispersing structure to carry magnetic flux generated by the permanent magnet to an upper portion of the predetermined space;  
a lower pole piece having a magnetic flux concentrating structure to carry the magnetic flux to a lower portion of the predetermined space,  
wherein the upper pole piece comprises:  
a ring-shaped magnetic flux receiving portion disposed between the permanent magnet and the anode to receive magnetic flux generated by the permanent magnet;  
a slanted portion downwardly slantingly extended from an inner edge of the ring-shaped magnetic flux receiving portion to an upper portion of the predetermined space to carry received magnetic flux to the upper portion of the predetermined

space; and

a magnetic flux dispersing portion upwardly slantingly  
extended from an inner edge of the slanted portion to disperse the carried magnetic flux; and  
at least one yoke magnetically connecting the permanent magnet with the  
lower pole piece.

~~a ring-shaped anode forming a plurality of resonance circuits;~~  
~~a cathode disposed at an axial center of the anode to emit thermions,~~  
~~separated from the anode by a predetermined space;~~  
~~a ring-shaped permanent magnet provided above the anode;~~  
~~an upper pole piece having a magnetic flux dispersing structure to carry~~  
~~magnetic flux generated by the permanent magnet to an upper portion of the predetermined~~  
~~space;~~

~~a lower pole piece having a magnetic flux concentrating structure to carry~~  
~~the magnetic flux to a lower portion of the predetermined space; and~~

~~at least one yoke magnetically connecting the permanent magnet with the lower pole~~  
~~piece;~~

~~the magnetron generating a high frequency particle beam; and~~

~~a control unit to control an intensity of the high frequency particle beam.~~

29. (original) The high frequency apparatus of claim 28, wherein the apparatus is one of: a high frequency heating apparatus, a particle accelerator and a radar unit.

30. (withdrawn) A high frequency heating apparatus, comprising:

a high frequency particle accelerating unit comprising:

a magnetron, comprising:

a ring-shaped anode forming a plurality of resonance circuits;  
a cathode disposed at an axial center of the anode to emit thermions,  
separated from the anode by a predetermined space;  
a ring-shaped permanent magnet provided below the anode;  
an upper pole piece having a magnetic flux dispersing structure to carry  
magnetic flux generated by the permanent magnet to an upper portion of the predetermined  
space;

a lower pole piece carrying the magnetic flux to a lower portion of the  
predetermined space; and

at least one yoke magnetically connecting the permanent magnet with the

lower pole piece,  
the magnetron generating a high frequency particle beam; and  
a control unit to control an intensity of the high frequency particle beam.

31. (withdrawn) The high frequency apparatus of claim 30, wherein the apparatus is one of: a high frequency heating apparatus, a particle accelerator and a radar unit.

32. (original) A high frequency heating apparatus, comprising:  
a high frequency particle accelerating unit comprising:  
a magnetron, comprising:  
a ring-shaped anode forming a plurality of resonance circuits;  
a cathode disposed at an axial center of the anode to emit thermions,  
separated from the anode by a predetermined space;  
a ring-shaped permanent magnet provided above the anode;  
at least one yoke;  
a lower pole piece carrying magnetic flux generated by the permanent magnet to an upper portion of the predetermined space;  
an upper pole piece comprising a ring-shaped magnetic flux receiving portion designed to receive magnetic flux carried through the at least one yoke from the permanent magnet, and a slanted portion upwardly slantingly extended from an inner edge of the ring-shaped magnetic flux receiving portion to a lower portion of the predetermined space to carry received magnetic flux to the lower portion of the activating space; and  
the at least one yoke magnetically connecting the permanent magnet with the lower pole piece,  
the magnetron generating a high frequency particle beam; and  
a control unit to control an intensity of the high frequency particle beam.

33. (original) The high frequency apparatus of claim 32, wherein the apparatus is one of: a high frequency heating apparatus, a particle accelerator and a radar unit.

34. (cancelled)

35. (cancelled)